The Ins & Outs of Water Conservation

Grade Level:
Middle School, High School

Subject Areas:
All

Duration:
Preparation time: depends on activity

Activity time: depends on activity

Setting:
Depends on activity

Skills:
Depends on activity

Vocabulary:
pre-assessment, concept map

Summary

Concept maps and other assessment tools indicate students' interests, ideas, experiences, and knowledge related to water conservation concepts prior to, during, and following participation in activities and lessons.

Objectives

Students will:

- contribute to and generate classroom concept maps to assess their knowledge, skills, and attitudes (and connections with the knowledge, skills, and attitudes of others) before, during, and after participation in activities and lessons concerning water conservation.
- analyze *Water Surveys* to determine if they experience any changes in attitude or behaviors related to water conservation practices after participating in lessons and activities.

Materials

Option 1

- index cards (3 per student)
- markers
- masking tape
- large sheets of flip chart paper or butcher paper

Option 2

- large sheet of paper (1 per classroom)
- markers (at least three different bold colors)

Option 3

- *Water Survey* Student Copy Page (2 copies per student)

Background

Learning is an interconnected, interdependent, and ordered process. Assessing students' prior knowledge or preconceptions is a vital component of effective teaching. Students' preconceptions may be accurate and facilitate learning, or they may be misconceptions that can impede learning. Students' prior knowledge related to water conservation can be used to plan activities and to make concepts more relevant to the learner. Teachers introducing new concepts or nonformal educators who are contacting students for the first time need to assess the class's level of understanding of the topic to be presented. The lessons and activities of *Conserve Water* include a variety of pre-assessment strategies, allowing teachers to determine what students know and think about water conservation before introducing a new aspect of the topic.

Procedure

Warm Up

The *Warm Up* section of each *Conserve Water* activity includes suggested methods for assessing what students

currently think and feel about the forthcoming water-related concepts. These approaches include the following: asking students thought-provoking questions; having students create diagrams to illustrate their perceptions; providing students with a demonstration and encouraging discussion.

These strategies can help educators determine if students already have an understanding of the topic. If they do, further study may not be necessary, or the activity could be conducted for reinforcement. On the other hand, students may have limited information and may require additional instruction prior to the activity.

The Activity

Option 1

"Concept Maps are drawings or diagrams showing the mental connections that students make between a major concept the instructor focuses on and other concepts they have learned." *Classroom Assessment Techniques* by Thomas A. Angelo and K. Patricia Cross

1. Inform students that they will be involved in lessons and activities related to water conservation. Give each student three index cards and ask him or her to write or draw one idea related to water conservation on each card. Students should limit their writing to a few words or a single sentence.
2. Ask a student to describe or read aloud one of his or her cards. Ask the class if anyone has a similar description. Collect related cards and tape them in a group on the wall. Repeat the procedure and continue forming groups until all the cards are posted. The number of groups generated will depend on the size of the class.
3. Draw or tape a circle around each group and ask students to suggest a title that describes the common element among the cards in a group. Write this on a card and attach it to the surrounding circle. Explain that each group is a separate "idea pool" (a collection of related ideas, topics, or concepts). Students may note overlaps among pools.
4. Have students describe the links among pools. Record these links on the map. Discuss the network of idea pools.
5. Challenge groups of students to create a story or write a paragraph using all of the idea pools. Encourage them to present their story using a variety of techniques, such as role-playing, storytelling, or pantomime.
6. Ask students to evaluate their stories or presentations. What information did they feel confident in using? What connections seemed weak? Have them identify what they think is factual information about water conservation and note topics that they would like to learn more about.

Option 2

"An ideal use of this technique [concept maps] is to employ it before, during, and after lessons on critical concepts." Angelo and Cross

1. Another method for creating a classroom concept map is to write the topic in the center of a large sheet of paper posted in front of the group.
2. Ask students to contribute any words or ideas they associate with this concept. Request that they link ideas by drawing lines between them. They can often add verbs to the lines to clarify relationships among their thoughts.
3. Record the initial words or ideas in one distinct color. During a unit on water conservation, assess changes in student knowledge and attitudes by inviting them to contribute to the map again. Record student responses in a color different from the one used in the initial session. Create a key to show the relationship of the color to the order of sessions (such as blue before, green during, and red following instruction).
4. After the final lesson or activity, ask students to contribute to the concept map and to draw connections among ideas. Point out to students how the different colors demonstrate the growth of their ideas and understanding about water conservation.

Moving from idea to idea, discuss with students why their attitudes may have changed over time. Was there any relationship between their growth in knowledge and understanding and their change in attitude and behavior?

Option 3

1. Before teaching activities and lessons from *Conserve Water*, distribute the *Water Survey* to students. This sample survey is a list of behaviors related to water conservation. Add or delete questions to tailor it for your specific use.
2. Ask students to complete the survey, then collect it.
3. In order to assess changes in behavior related to water conservation, after completing a number of activities, lessons, and supplementary case studies, distribute the survey again.
4. After students have completed the form a second time, hand back their original survey. Have them compare and contrast their responses on the two surveys.
5. Ask them if there were any changes in their behavior related to water conservation. What do they believe contributed to the changes?
6. It may be interesting to tabulate the changes for the entire class and see if there were any trends. It may be possible to assign this task to one or two students. To protect students' anonymity, forms could be numbered and a key retained to match student names and numbers.

Wrap Up

The *Wrap Up* of *Conserve Water* activities is used to bring closure to activities; however, it can also confirm acquisition of knowledge. One approach is to compare students' responses in the *Wrap Up* to similar questions found in the *Warm Up*. Further, in all activities, each objective is matched with an assessment.

Assessment

Have students:

- present what they currently know about water conservation in the form of concept maps (**Option 1**, steps 1-4)
- contribute to a classroom concept map before, during, and after instruction to indicate their acquisition of knowledge and changes in attitude and behavior (**Option 2**, steps 2-4)
- have students complete a Water Survey before and after instruction to assess changes in attitude and behavior related to the conservation of water resources. (**Option 3**, steps 1—4)

Extensions

Teachers may wish to review the publication *Classroom Assessment Techniques* written by Thomas A. Angelo and K. Patricia Cross. This resource offers fifty classroom assessment techniques. Most of these techniques can be modified to assess changes in student knowledge, interests, attitudes, and behavior related to water conservation. By understanding what students are learning and how well they are learning it, educators can modify the teaching process to accommodate the needs and interests of the learners. As you find ways to modify the activities, if you would be willing to share with other educators, please send your changes to: The Watercourse (Attention: *Conserve Water)* 201 Culbertson Hall, Montana State University, Bozeman, Montana 59717-0570.

Resources

Angelo, Thomas A., and K. Patricia Cross. 1993. *Classroom Assessment Techniques.* San Francisco: Jossey-Bass Publishers.

Biehler, Robert F., and Jack Snowman. 1986. *Psychology Applied to Teaching*, 5th ed. Boston: Houghton Mifflin Company.

Gagne, Ellen D. 1985. *The Cognitive Psychology of School Learning.* Boston: Little, Brown & Company.

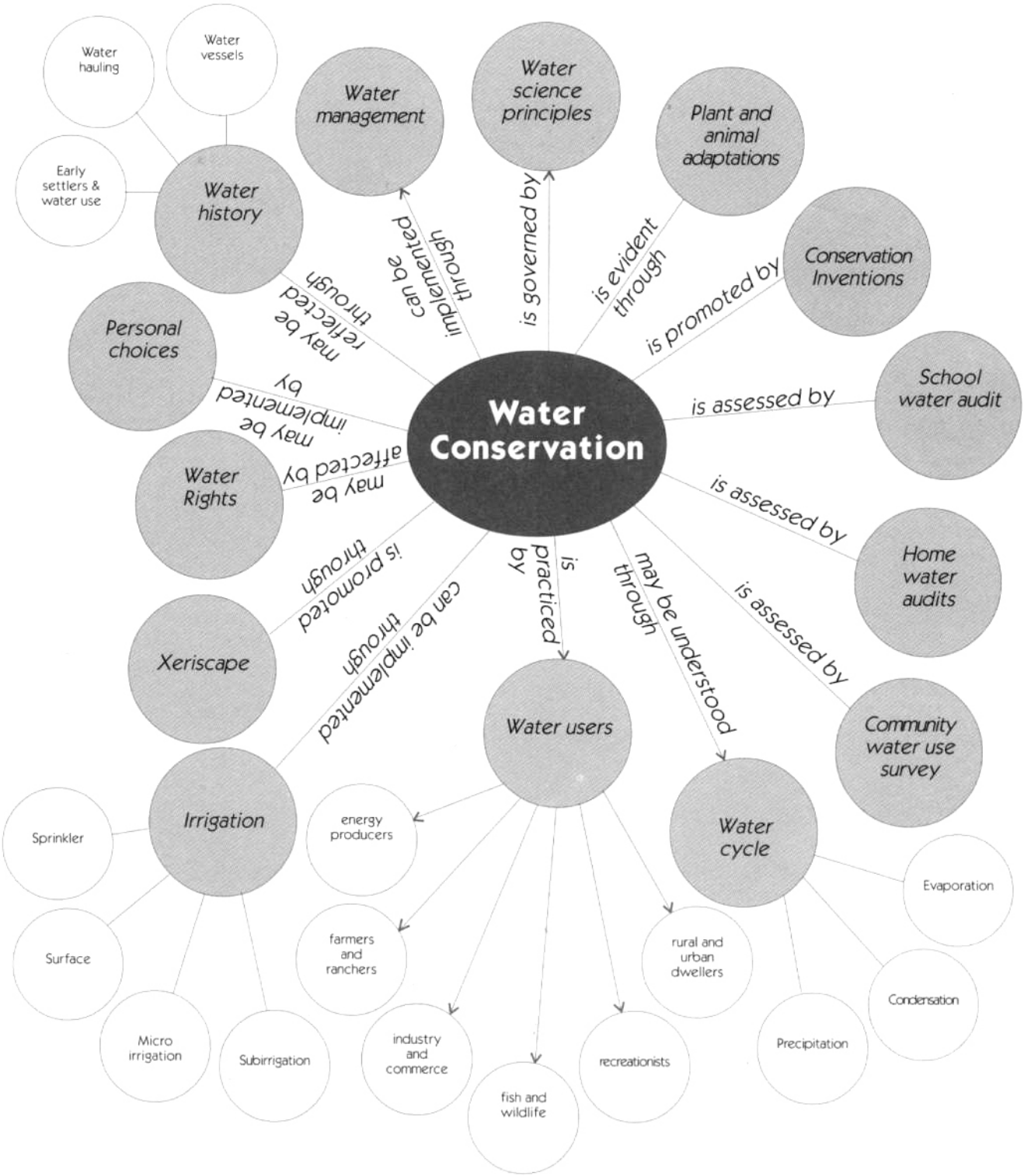
Novak, J. D., and D. Bob Gowin. 1986. *Learning How to Learn.* New York: Cambridge Univer sity Press.

Novak, Joseph. 1991. "Clarify with Concept Maps, a Tool for Students and Teachers Alike."

The Science Teacher. 58 (7): 45–49.

Saunders, Walter L. 1992. "The Constructivist Perspective: Implications and Teaching Strategies for Science." *School Science and Mathematics* 92 (3): 136-141.

Water Conservation Concept Map (Example)



The Ins & Outs of Water Conservation Water Survey

Directions

Following is a list of water-related behaviors. Record your responses based on what activities you currently participate in. Do not respond based on what you think you should probably do or what others tell you to do. Please indicate yes, no, don't know (?) or N/A. If you place a check under the column N/A, it means "this does not apply to me." There are no right or wrong answers. You will not be graded on this.

	Yes	No	(?)	N/A
While brushing my teeth, I turn the water off and on as needed.				
I limit the length of my showers so they are three to five minutes.				
When washing my hands, I turn the water off and on as needed.				
I wash my clothes when there is a full load of laundry.				
I run the dishwasher when there is a full load of dishes.				
I turn the hose off and on as needed while I wash the car.				
When asked to clean the sidewalk, I sweep it instead of hosing it down.				
When asked to water the lawn, I do it when I can, at any time of day.				
When changing the oil in my car or my family's car, I take the dirty oil to a disposal center.				
When washing dishes in the sink, I allow the water to run so it is easy to rinse them.				
When I want a glass of water, I let the water run so it will get cold.				
If I saw a leaking water pipe in my community, I would report it to my parents or the appropriate authority.				
If there was an oil leak from my (or my family's) car, I would get it fixed as soon as possible.				
I encourage my family to install water-saving devices (such as water-saving shower heads) in the bathroom and kitchen.				
I keep a bottle of drinking water in the refrigerator so I don't need to run the water from the faucet to get it cold.				
I would help my school design and change the school grounds into a water-conservative landscape.				

This activity was used with permission from Project WET. Project WET guides are available through teacher in-service workshops offered statewide. For more information about workshops, please visit www.deq.state.va.us/education/wetinfo.html. You can order a copy of the Water Conservation guide from which these activities are reprinted by visiting www.montana.edu/wwwwater/publications/module.html#educators%20%20